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[Claim(s)]
[Claim 1]A polarization separation machine divided into 2 polarization which intersected incidence light perpendicularly in a **** spin mirror which is made to rotate the polarization direction of incidence light and is reflected, A **** spin mirror arranging 2 polarization which separated one light guide holding the polarization direction, respectively so that it may enter into an end face from which a light guide differs in parallel with the same principal axis of a light guide.
[Claim 2]After dividing incidence light into 2 polarization which intersected perpendicularly in a **** spin mirror which is made to rotate the polarization direction of incidence light and is reflected, A **** spin mirror having consisted of a polarization separation machine with a light guide which maintains the polarization direction of each polarization and guides waves, and combining an outgoing end of two light guides of this polarization separation machine with a light guide so that the polarization direction of 2 polarization may be in agreement.
[Claim 3]A polarization separation machine divided into 2 polarization which intersected incidence light perpendicularly in a **** spin mirror which is made to rotate the polarization direction of incidence light and is reflected, [two light guides holding the polarization direction, and a polarization rotation child who rotates the polarization direction 90 degrees] A **** spin mirror having arranged so that 2 separated polarization is combined with an input edge of a respectively different light guide, and the polarization direction of 2 polarization by an outgoing end may intersect perpendicularly mutually and may combine an outgoing end of these two light guides on both sides of a polarization rotation child in between.
[Claim 4]A polarization separation machine divided into 2 polarization which intersected incidence light perpendicularly in a **** spin mirror which is made to rotate the polarization direction of incidence light and is reflected, A **** spin mirror arranging 2 polarization, respectively so that it may enter into an end face from which a light guide differs in parallel with the same principal axis of a light guide after passing a polarization rotation child for one side of 2 polarization which separated one light guide holding the polarization direction, and a polarization rotation child who rotates the polarization direction 90 degrees.

[Detailed Description of the Invention]
[0001]

[Industrial Application]This invention relates to Optical Devices Division, device, and method which have the polarization dependence used for optical communications, an optical computer, etc.

[0002]

[Description of the Prior Art]In recent years, the phenomenon and element for which it depends in the polarization directions, such as a nonlinear optical effect and a semiconductor laser amplifier, attract attention in fields, such as optical communications and an optical computer. It follows on it, the art which adjusts and controls a polarization state has become important, and the performance which rotates the polarization direction also in an optical mirror is needed. For example, as one example of application of the **** spin mirror which is made to rotate those [these] for ****** and is reflected, a patent "separation and multiplex device of a lightwave pulse" (JP,63-4979,A) is raised. Drawing 7 shows a part of this example of application. N is a nonlinear optical medium which has double reflex nature among a figure, and the arrow in a circle shows the principal axis of the nonlinear optical medium. (a) - (d) is a lightwave pulse in each position, and the arrow in a circle shows the polarization direction of light. PM is a polarization spin mirror which rotates polarization 90 degrees. Since the angle which the polarization direction of incidence light (a) and the principal axis of the nonlinear optical medium N make is 45 degrees, incidence light divides it into an ingredient parallel to two principal axes. Since refractive indicees differ in each polarization direction, it dissociates on a time-axis and becomes (b) and (b') (**** distribution). Then, it is reflected by the **** spin mirror PM. At this time, polarization of a reflected light (c) and (c') becomes what rotated polarization of (b) and (b') 90 degrees, respectively. Therefore, when this (c) and (c') return the inside of a nonlinear optical medium, the **** distribution produced by the double reflex of the nonlinear optical medium N on the outward trip can be compensated with a return trip. Twice-izing [the effective operation length L of a nonlinear optical effect] since it goes back and forth.

[0003]Hereafter, the conventional composition of this **** spin mirror is explained. The conventional **** spin mirror had added a means to polarize the polarization direction to the total reflection mirror. Drawing 8 (1), (2), and (3) is a figure showing the conventional **** spin mirror. A total reflection mirror and QP of M are 1/4 wavelength plates among drawing 8 (1). A principal axis makes the principal axis of the nonlinear optical medium N, and 45 degrees, and is arranged, and the 1/4 wavelength plates QP are a principal axis of the nonlinear optical medium N, 45 degrees, and 135. 1/4 wave of phase contrast is given between two rectangular ingredients which make a degree. As shown in the figure, the polarization direction rotates the polarization component of an incidence light parallel to two principal axes principal axes and the nonlinear optical medium N cross at right angles 90 degrees, respectively by arranging this 1/4 wavelength plate QP ahead of total reflection mirror M. That is, the polarization direction rotates a reflected light 90 degrees. Drawing 8 (2) is the 2nd example of the conventional construction. The inside F of a figure is the Faraday element, and adds the magnetic field of an optical axis direction to Faraday elements, such as YIG. If the length of the Faraday element and the strength of a magnetic field are chosen suitably and the polarization direction is rotated 45 degrees for one of the two, a reflected light will rotate 90 degrees. Drawing 8 (3) is the 3rd example of the conventional construction. PR comprise here a rectangular prism which has a two-sheet mirror which has two reflective surfaces which intersect perpendicularly, or two total-internal-reflection sides which intersect perpendicularly. In this case, it is arranged so that the line of intersection 1 of the two reflective surfaces R and L may make the polarization direction of incidence light, and 45 degrees. Since the light reflected in two reflective surfaces sets an axis of symmetry as the line of intersection 1 at this time and

right and left interchange, the polarization direction rotates 90 degrees.
[0004]However, in order that the characteristic of the wavelength plate used as a component or an isolator might be greatly dependent on a wavelength, the conventional **** spin mirror had the problem that it could be used only on a specific wavelength, and had the problem that a constituent child's manufacture will become easily and expensive. In the case of the 3rd conventional example, wavelength dependence was not, but in order that the rotation of a twice as many angle as this to the line of intersection of the reflective surface of the incidence polarization direction might occur, there was a problem that the uniform degree of rotation angle was not obtained to arbitrary polarization.
[0005]
[Problem to be solved by the invention]The place which this invention was made in view of the above, and is made into the purpose is a wide range wavelength, and there is in providing the **** spin mirror of simple composition of rotating 90 degrees and reflecting to the incidence light of the arbitrary polarization directions.

[0006]
[Means for solving problem]In order to solve said SUBJECT, [the polarization spin mirror of this invention] It comprises a polarization separation machine which divides incidence light into the 2 polarization which intersected perpendicularly, and one light guide holding the polarization direction, and let it be a gist to arrange the 2 separated polarization, respectively so that it may enter into the end face from which a light guide differs in parallel with the same principal axis of a light guide.
[0007]It consists of a polarization separation machine with a light guide which maintains the polarization direction of each polarization and guides waves, and let it be a gist to have combined the outgoing end of two light guides of this polarization separation machine with a light guide so that the polarization direction of 2 polarization might be in agreement, after dividing incidence light into the 2 polarization which intersected perpendicularly. The polarization separation machine which divides incidence light into the 2 polarization which intersected perpendicularly and two light guides holding the polarization direction, The 2 polarization which separated the polarization rotation child who rotates the polarization direction 90 degrees is combined with the input edge of a respectively different light guide, the polarization direction of 2 polarization by an outgoing end intersects perpendicularly mutually, and they are photoconductive [these / two]. Let it be a gist to have arranged so that the outgoing end of **** may be combined on both sides of a polarization rotation child in between.
[0008]
[Function]This invention is a wide range wavelength and can provide the **** spin mirror of simple composition of rotating 90 degrees and reflecting to the incidence light of the arbitrary polarization directions.

[0009]
[Working example]Hereafter, the embodiment of this invention is described using Drawings. Drawing 1 is a lineblock diagram of the polarization spin mirror concerning the 1st embodiment of this invention. As for the light guide for which PBS holds a polarization separation machine among a figure, and G holds the polarization direction, L1, and L2, a light guide end face, A1, and A2 are the principal axes (a late axis, quick axis) of a light guide an optical lens, P1, and P2. The polarization separation machine PBS is what divides the light which entered into two polarization polarization and **** cross at right angles, For example, . [a

rectangular prism] . [the polarization beam splitter or Mach-Zehnder type interference system which were united two] Used photoconductive wave type polarization BIMUSUPI lytta (Reference-documents .) M.Okuno et al.,Springer Series in Electronics and Photonics,vol.29 Photonics Switching II,pp92-95(1990) is raised. The light guide G is arranged so that the 2 separated polarization may enter in parallel with the end face P1 and the principal axis (axis A1 late in this example) same at P2, respectively. For example, the above arrangement is possible if it twists 90 degrees at the arbitrary places of an optical fiber using a PANDA type polarization maintenance fiber as a light guide. At this example, although the optical lens L1 and L2 are used, as long as combination of the light between the polarization separation machine PBS and the light guide G is good enough, it may not be.

[0010]A principle of operation of this invention is explained using drawing 2. If incidence light of arbitrary polarization states enters from an entrance plane of the polarization separation machine PBS (drawing 2 (A)), it will separate into two polarization components which intersect perpendicularly with the polarization separation machine PBS, and will enter into the end face P1 of the light guide G, and P2, respectively (drawing 2 (B)). At this time, it is parallel to the principal axis A1 of the light guide G also to 2 polarization. 2 lights which entered guide waves, respectively, holding the polarization direction in the principal-axis A1 direction (drawing 2 (C)). Then, 2 polarization is rotated for the polarization direction by twist of the T section of the light guide G 90 degrees (drawing 2 (D)). Waves are guided holding the polarization direction on A1 axis also after that, and it is emitted from an end face different from a time of entering, respectively (drawing 2 (E)). Since outgoing radiation light from P1 and P2 is in agreement with the incidence polarization direction, respectively, if it returns to the polarization separation machine PBS again, polarization composition will be carried out and it will be emitted from an entrance plane of the first PBS. At this time, the polarization direction of a reflected light was rotating polarization of incidence light 90 degrees.

[0011]Drawing 3 is a lineblock diagram of the polarization spin mirror concerning the 2nd embodiment of this invention. A polarization separation machine with a light guide, P1, and P2 are the outgoing end sides of a polarization separation machine with a light guide PBS2 among a figure. Polarization separation machine PBS2 consists of the optical waveguide part g2 and g3 which guide the optical waveguide part g1 which guides incidence light, the separation part s divided into the 2 polarization which intersects perpendicularly, and each separated polarization with the polarization direction maintained. Specifically, optical fiber type polarization BIMUSUPI lyttas (made by Hitachi Cable, Ltd. etc.) are raised, for example. As shown in drawing 3, the screw of each other is combined 90 degrees so that the polarization direction of the polarization which guided the optical waveguide part g2 of this polarization separation machine PBS2 with a light guide, each end face P1 of g3, and P2 may be in agreement. Then, by the same principle as Embodiment 1, incidence light rotates the polarization direction 90 degrees, and is reflected.

[0012]Drawing 4 (a) is a lineblock diagram of the polarization spin mirror concerning the 3rd embodiment of this invention. The light guide in which G2 and G3 hold the polarization direction, and PT are 90-degree polarization rotation children who rotate the polarization direction 90 degrees among a figure. As the polarization separation machine PBS, the polarization beam splitter described in Embodiment 1 can be used. A light guide, and G2 and the thing which formed the channel type light guide on [other than the above-mentioned polarization maintaining optical fiber] plates, such as a quartz system and a semiconductor, if G3 were taken can be used. The 2 separated polarization enters in parallel with the light guide G2 and the principal axis of G3, respectively, and the light guide G2 and G3 are arranged so that the

mutual polarization direction may intersect perpendicularly by an outgoing end. What was shown, for example in drawing 5 as a polarization opening child PT 90 degrees can be used. To the polarization direction of 2 polarization, drawing 5 (a) rotates 45 degrees and arranges the principal axis of 1/2 wavelength plate. Drawing 5 (b) is the Faraday rotation child who rotates the polarization direction 90 degrees. Fig. 5 (c) is a mode converter which adds stress in the direction rotated 45 degrees to the principal axis of a channel type light guide, and changes TE and TM mode. The light guide G2 and G3 are combined via polarization rotation child PT these 90 degrees. Then, in order that the polarization rotation child PT may operate a 90-degree twist of the polarization maintaining optical fiber described in Embodiment 1 these 90 degrees, by the same principle as Embodiment 1, incidence light rotates the polarization direction 90 degrees, and is reflected.

[0013]Although this example also uses the optical lens L1, L2, L3, and L4, It may not be, as long as combination of the light between the polarization separation machine PBS, between the light guides G2 and the polarization separation machine PBS, between the light guides G3 and the light guide G2, between 90-degree polarization rotation child PTs and the light guide G3, and 90-degree polarization rotation child PT is good enough respectively. Since in the case of this example polarization rotation child PT can be formed on plates, such as the same quartz system and a semiconductor, polarization separation machine PBS, light guide G2, and light guide G 3 or 90 degrees as shown in drawing 4 (b), it can miniaturize. Stabilization of operations, such as combination between each component, is possible.

[0014]Drawing 6 is a lineblock diagram of the polarization spin mirror concerning the 4th embodiment of this invention. G4 is a light guide holding the polarization direction. Polarization rotation child PT has been arranged immediately after one outputting part of the polarization separation machine PBS 90 degrees, and the light guide G4 is arranged so that the polarization direction may enter the 2 separated polarization into polarization at the same principal axis of the light guide G4. It operates by the same principle as Embodiment 3.

[0015]

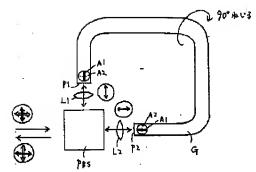
[Effect of the Invention]As explained above, according to this invention, the polarization which rotated polarization of incidence light 90 degrees can be emitted to an opposite direction with easy composition. Also to the incidence light of arbitrary polarization states, since it is usable, relative-related adjustment of the principal axis of the polarization direction which was necessity conventionally, and a constituent child becomes unnecessary. And according to Claim 1 and the invention of 2, since a polarization separation machine and the light guide can maintain the characteristic in the wide wavelength range, can expand the operating wavelength range and can ease the performance to a constituent child, they can reduce a manufacturing cost sharply. According to Claim 3 and the invention of 4, since-izing of each component can be carried out [mono-SHIRIKKU], effects -- a miniaturization and stabilization of operation are possible and it is -- are size.

[Brief Description of the Drawings]

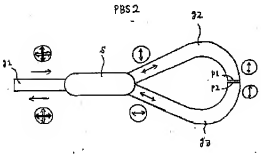
[Drawing 1]The lineblock diagram of the polarization spin mirror which is the 1st embodiment of this invention.

[Drawing 2]The figure explaining the principle of operation of the 1st embodiment.
[Drawing 3]The lineblock diagram of the polarization spin mirror which is the 2nd embodiment of this invention.
[Drawing 4]The lineblock diagram of the polarization spin mirror which is the 3rd embodiment of this invention.
[Drawing 5]The figure showing a polarization rotation child's example of composition 90 degrees.
[Drawing 6]The lineblock diagram of the polarization spin mirror which is the 4th embodiment of this invention.
[Drawing 7]The figure showing the example of application of a **** spin mirror.
[Drawing 8]The lineblock diagram of the conventional **** spin mirror.

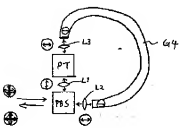
[Drawing 1]



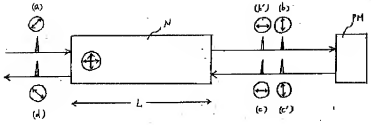
[Drawing 3]



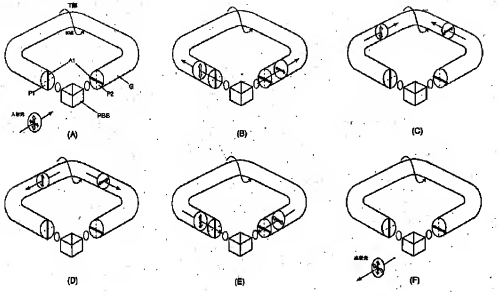
[Drawing 6]



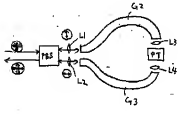
[Drawing 7]



[Drawing 2]



[Drawing 4]



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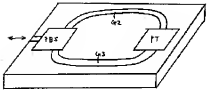
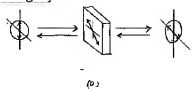


(b)

[Drawing 5]



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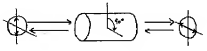

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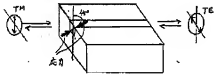
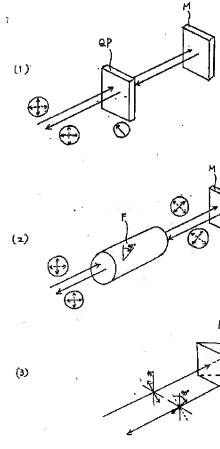


(c)

[Drawing 8]



[Translation done.]